

CLAIMS

1. A substrate polishing apparatus comprising:
a polishing table having a polishing surface;
5 a substrate holder for holding and pressing a substrate against said polishing surface of said polishing table; and
a film thickness measuring device for measuring a thickness of a film on the substrate;
10 wherein said substrate holder has a plurality of pressure adjustable chambers, and pressures in said respective chambers are adjusted based on the film thickness measured by said film thickness measuring device.
- 15 2. A substrate polishing apparatus according to claim 1, wherein said film thickness measuring device measures film thicknesses of a plurality of zones of the substrate corresponding to said respective chambers, and the pressures in said respective chambers are adjusted based on 20 the film thicknesses of the respective zones measured by said film thickness measuring device.
- 25 3. A substrate polishing apparatus according to claim 2, further comprising:
a storage device for storing polishing conditions each for the respective zones of the substrate;
a calculating device for calculating polishing rates at the respective zones of the substrate based on the film thicknesses of the respective zones measured by said film 30 thickness measuring device; and
a correcting device for correcting the polishing conditions including the pressures in said chambers based on the calculated polishing rates.

4. A substrate polishing apparatus according to claim 1, wherein said film thickness measuring device measures the thickness of the film on the substrate after the substrate is polished.

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5. A substrate polishing apparatus according to claim 1, wherein said film thickness measuring device measures the film thickness of the film on the substrate while the substrate is being polished.

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6. A substrate polishing apparatus according to claim 1, wherein:

the substrate is moved to pass across a detection sensor of said film thickness measuring device so that time-series data are obtained by said detection sensor; and

said film thickness measuring device assigns the time-series data to the zones of the substrate so as to obtain the film thicknesses of the respective zones.

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7. A substrate polishing apparatus according to claim 1, wherein said film thickness measuring device comprises an eddy current sensor, an optical sensor, a temperature sensor, a torque current sensor, or a microwave sensor.

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8. A method of polishing a substrate by pressing the substrate against a polishing surface of a polishing table, said method comprising:

holding the substrate by a substrate holder which has a plurality of pressure adjustable chambers;

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measuring film thicknesses of a plurality of zones of the substrate corresponding to said respective chambers by a film thickness measuring device; and

adjusting pressures in said respective chambers based on the measured film thicknesses of the respective zones.

9. A method according to claim 8, wherein:

said film thickness measuring device comprises at least one of an eddy current sensor, an optical sensor, a temperature sensor, a torque current sensor, and a 5 microwave sensor; and

the film thicknesses of the respective zones are derived from a signal or a combination of signals from at least one of said sensors suitable for the type of film on the substrate.

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10. A method according to claim 8, wherein an operation mode for polishing the substrate is switched to another based on the film thicknesses measured by said film thickness measuring device.

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11. A method according to claim 8, wherein an operation mode of said film thickness measuring device is switched to another based on the film thicknesses measured by said film thickness measuring device.

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12. A method according to claim 8, wherein a timing to stop polishing the substrate is detected based on the film thicknesses measured by said film thickness measuring device.

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13. A method according to claim 8, wherein:

an eddy current sensor is used as said film thickness measuring device for measuring the film thicknesses of the respective zones of the substrate;

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the substrate is moved to pass across a detection sensor of said film thickness measuring device so that time-series data are obtained by said detection sensor; and
the time-series data are assigned to the zones of the substrate so as to obtain the film thicknesses of the 35 respective zones.

14. A method according to claim 8, wherein the film thicknesses of the respective zones of the substrate are measured repeatedly and the pressures in said chambers are adjusted repeatedly so that the film thicknesses of the 5 respective zones converge within a predetermined range.

15. A method of measuring a thickness of a film on a substrate, said method comprising:

providing a sensor circuit which faces the substrate;
10 electromagnetically coupling the substrate and said sensor circuit to each other;
converting a change in impedance of said sensor circuit into a resonance frequency of said sensor circuit;
measuring a change in the resonance frequency; and
15 calculating a change in the film thickness based on the change in the resonance frequency.

16. A substrate polishing apparatus comprising:

a polishing surface for polishing a surface of a
20 substrate;
a substrate holder for holding the substrate to bring the surface of the substrate into contact with said polishing surface;
a sensor circuit disposed closely to said polishing
25 surface;
an impedance-frequency conversion circuit for converting a change in impedance of said sensor circuit into a resonance frequency of said sensor circuit and the substrate; and
30 a frequency-thickness conversion circuit for converting a change in the resonance frequency into a thickness of a film on the surface of the substrate.

17. A method of measuring a thickness of a film on a substrate, said method comprising:

providing a sensor circuit which faces the substrate;

5 electromagnetically coupling the substrate and said sensor circuit to each other;

measuring a change in impedance of said sensor circuit; and

detecting a change in the film thickness based on the change in the impedance.

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18. A substrate polishing apparatus comprising:

a polishing surface for polishing a surface of a substrate;

15 a substrate holder for holding the substrate to bring the surface of the substrate into contact with said polishing surface;

a sensor circuit disposed closely to said polishing surface; and

20 an impedance-thickness conversion circuit for converting a change in impedance of said sensor circuit into a thickness of a film on the surface of the substrate.